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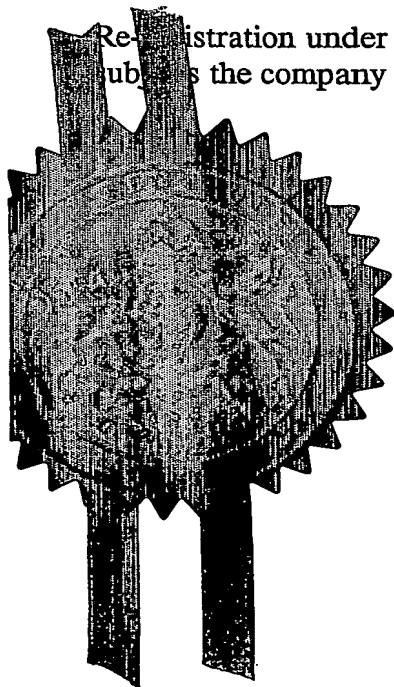
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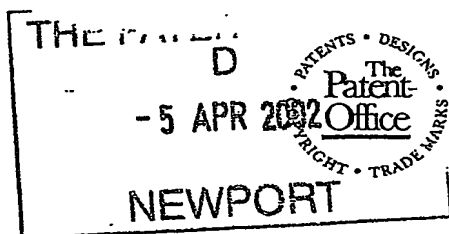
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2. Patent application number (The Patent Office will fill in this part)	0207851.7		
3. Full name, address and postcode of the or of each applicant (underline all surnames)	SPS-AFOS Group Limited Arnhall Business Park Westhill ABERDEEN AB32 6UF United Kingdom		
Patents ADP number (if you know it)			
If the applicant is a corporate body, give the country/state of its incorporation	UK		
4. Title of the invention	Stabiliser jetting and circulating tool		
5. Name of your agent (if you have one)	Kennedys Patent Agency Limited Floor 5, Queens House 29 St Vincent Place GLASGOW G1 2DT United Kingdom		
"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)			
Patents ADP number (if you know it)	8001398001		
6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number	Country	Priority application number (if you know it)	Date of filing (day / month / year)
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Continuation sheets of this form

Description

13

Claim(s)

Abstract

Drawing(s)

3

α3



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Priority documents

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Statement of inventorship and right to grant of a patent (Patents Form 7/77)

Request for preliminary examination and search (Patents Form 9/77)

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Any other documents (please specify)

11. I/We request the grant of a patent on the basis of this application.

Signature
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Date
04 April 2002

12. Name and daytime telephone number of person to contact in the United Kingdom
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1 Stabiliser jetting and circulating tool

2
3 The present invention relates to downhole tools used in
4 well bores and in particular to a downhole tool which
5 provides the combined functions of stabilising, jetting
6 fluid and circulating fluid within the well bore.
7

8 In drilling or completing a well bore, for oil or gas it
9 has been recognised that significant time and cost
10 savings can be made if a number of tools providing
11 different functions can be mounted on the same work
12 string and run together into the well bore. Each tool
13 mounted on the work string must be capable of being
14 operated independently. A large number of methods of
15 operating tools on a work string have been developed and
16 they typically include ball activated, weight activated
17 or hydraulically activated tools.
18

19 However there are disadvantages in providing so many
20 tools on a work string. The location of each tool within
21 the well bore must be considered so that the string
22 requires minimal positioning and reciprocation in the
23 well bore to operate each tool. Additionally the time and

1 to direct fluid from the axial throughbore onto a
2 surface of the well bore; and
3 one or more actuating means to selectively direct
4 the fluid through the jetting ports and thereby
5 circulate the fluid.

6
7 Thus, the downhole tool of the present invention provides
8 a stabilising function, a jetting function for cleaning
9 and a fluid circulating function within a well bore. It
10 will be appreciated that a well bore includes a well bore
11 having a tubular such as a casing or liner located
12 therein.

13
14 Preferably, the one or more actuating means provides a
15 cyclic function. That is the one or more actuating means
16 can be operated to provide at least one cycle wherein
17 each cycle is an on/off/on or alternatively an off/on/off
18 function with respect to the exit of fluid through the
19 jetting ports.

20
21 In a preferred embodiment of the present invention, the
22 actuating means provides two cycles.

23
24 Preferably also, the actuating means is selected from a
25 group comprising ball activated, weight activated and
26 hydraulically activated or a combination thereof.

27
28 Preferably, the sleeve is threaded onto the body. More
29 preferably, the thread is a left-hand thread and thus
30 advantageously the sleeve will tighten while rotating.
31 Preferably, also, the outer diameter of the stabiliser
32 blades on the sleeve are sized to be close to the inner
33 diameter of the tubular in use. Thus, a large outer

1 diameter of the tool provided at the stabiliser blades
2 will improve the jetting effectiveness. Preferably, the
3 stabiliser blades are arranged in a helical pattern
4 around the sleeve. More preferably, there is triangular
5 flow-by groove between adjacent stabiliser blades. Such
6 triangular flow-by grooves minimise cutting action on the
7 surface of the well bore.

8
9 Preferably, the stabiliser blade has a central portion
10 including a surface parallel to the axial throughbore.
11 Advantageously, the one or more jetting ports are
12 arranged on the parallel surface of the stabiliser
13 blades. Thus, the jetting ports are arranged at the
14 closest position to the surface of the well bore.

15
16 Preferably also the blades include a milling surface.
17 Preferably, the milling surface is at a leading end of
18 the work string. Advantageously, the milling surface is
19 of tungsten carbide to provide a reaming or cutting
20 function and assist the tool in clearing obstacles and/or
21 removing debris from the surface of the well bore.

22
23 The jetting ports may be arranged substantially
24 tangentially to the axial throughbore. More preferably,
25 one or more jetting ports are arranged at an angle to the
26 tangential to provide a larger cleaning surface against
27 the surface of the well bore when the fluid is jetted.

28
29 Advantageously, each jetting port includes a nozzle. The
30 nozzle may be located at an exit of the jetting port. The
31 nozzles reduce the diameter available for fluid flow and
32 thereby increase the velocity of the flow as it exits the
33 tool. Advantageously, each nozzle is located below the

1 outer surface of the sleeve. This provides an advantage
2 in allowing wear of the tool to occur without obstructing
3 the nozzle so that the nozzles may be removed and
4 installed easily.

5
6 Preferably, a channel is located between the body and the
7 sleeve. Preferably, also, the jetting ports access the
8 channel. Advantageously, the one or more actuating means
9 direct fluid from the axial throughbore to the channel
10 prior to the fluid flowing through the jetting ports.
11 Thus, as the same jetting ports are used, each time the
12 actuating means operates, this minimises the potential
13 for leaks within the tool.

14
15 Embodiments of the present invention will now be
16 described, by way of example only, with reference to the
17 following Figures in which:

18
19 Figure 1 is a part cross-sectional schematic view of a
20 downhole tool according to a preferred embodiment of the
21 present invention;

22
23 Figure 2 is a cross-sectional schematic view of the
24 actuating means used in the tool of Figure 1. Figures
25 (a), (b) and (c) illustrate the actuating positions of
26 the tool.

27
28 Figure 3 shows an alternative actuating means, which may
29 be used in the downhole tool of the present invention.

30
31 Reference is initially made to Figure 1 of the drawings,
32 which illustrates a downhole tool generally indicated by
33 Reference Numeral 10, according to a preferred embodiment

1 of the present invention. Tool 10 has an upper end,
2 including a box section 14 for connection in a work
3 string (not shown). Tool 10 also has a lower end 16,
4 which includes a pin section 18 for connection in a work
5 string mounted below the tool 10. It will be appreciated
6 that although the references to upper and lower are
7 provided it will be understood by those skilled in the
8 art that the downhole tool of the present invention could
9 be used in a vertical, inclined or a horizontal position
10 in a well bore. It will further be appreciated that the
11 tool of the present invention has application within a
12 well bore during drilling operation or in a cased or
13 lined well bore where a tubular has been inserted during
14 completion.

15

16 Tool 10 comprises a tubular body 20. A sleeve 22, is
17 mounted around the body 20, and is held in place by a
18 threaded connection 24. The thread is left-handed so
19 that when the tool is rotated the sleeve 22 will be
20 tightened onto the body 20. O-rings 26, 28 are located
21 between the body 20 and the sleeve 22, to prevent the
22 ingress of dirt or the outflow of pressure between body
23 20 and the sleeve 22.

24

25 Mounted on sleeve 22 are a number of blades 30. Blades
26 30 are arranged in a helical pattern on the sleeve 22.
27 Each blade has a longitudinal body 32 with a sloping
28 front face 34 and a sloping back face 36, the front face
29 34 has a hardened surface 38, which partly extends onto a
30 planar surface 40 between the sloping faces 34,36. The
31 hardened surface 38 allows the blades 30 to contact
32 debris or other obstacles within the well bore and mill
33 them or clean them off.

1
2 Between the blades 30 are located channels 42. The
3 channels 42 have a triangular cross-section and act as
4 flow-by grooves between the blades to minimise cutting
5 action of the blades on the formation in the well bore.
6 Located on the planar section 40 of each blade are three
7 jetting ports 44A, B and C. Each port 44 A, B and C
8 provides access between a back surface 46 of the sleeve
9 22 and a front surface 48 of the sleeve 22.

10
11 The inlet ports 44A, B and C are arranged so that the
12 central port 44B is tangential to a central bore 50 which
13 runs through the body 20 while the ports 44A and C are
14 angled with respect to port 44B. Each port 44 includes a
15 nozzle 52, which reduces the diameter of the port 44 and
16 thereby increases the speed of fluid passing through the
17 port 44. Each port 44, contacts a channel 54, located
18 between the body 20 and the sleeve 22. This channel
19 houses fluid and the o-rings 26, 28 prevent the fluid
20 from escaping from the tool 10 by means other than those
21 provided at ports 44.

22
23 Within the body 20 there are located two inlet ports, 56,
24 58. Each inlet port 56, 58 is associated with an
25 actuating means 60, 62. The actuating means 60, 62 are
26 primarily located within the central bore 50. The
27 actuating means 60, 62 control the passage of fluid
28 within the central bore 50, through the ports 56, 58
29 respectively and into channel 54. This controls the
30 passage of fluid out of the tool via the inlet ports 44.
31 It will be appreciated that although only one inlet port
32 56, 58 is associated with each actuating means. 60, 62
33 there may be any number of inlet ports 56, 58 and equally

1 any number of actuating means 60, 62 as long as the fluid
2 from each is located within the channel 54.

3
4 Reference is now made to Figure 2 of the drawings which
5 illustrate an actuating means, generally indicated by
6 Reference Numeral 62, as would be found in the tool of
7 Figure 1. Like parts to those of Figure 1 have been
8 given the same Reference Numerals to aid interpretation.
9 The actuating means 62 is a drop ball activation means as
10 would typically be found in a downhole tool. An example
11 of such a downhole tool would be GB 2,341,405 to SPS-AFOS
12 Group Limited, the present Applicant. GB 2,341,405 is
13 hereby incorporated by reference.

14
15 Actuating means 62 comprises first 64 and second 66
16 sleeves arranged concentrically within the body 20. Each
17 sleeve, 64, 66 includes a respective port 68, 70. The
18 ports 68, 70 provide access through the sleeves 64,66.
19 It will be appreciated that each port 68, 70 generally
20 comprises a plurality of ports circumferentially arranged
21 on the sleeve 64, 66. As shown in Figure (a) the sleeves
22 are initially arranged side by side and held together via
23 a shear pin 72. Further, the pair of sleeves 64,66 are
24 held to the body by means of a second shear pin 74.
25 Shear pin 74 is located through the body 20 and into the
26 first sleeve 64.

27
28 In use, the tool 10 is run into the well bore or tubular.
29 The diameter of the tool 10 at the blades 30 would be
30 selected to provide a small clearance between the tool
31 and the surface of the well bore or tubular. A typical
32 clearance may be a number of millimetres.

1 Once located at the point where fluid is required to be
2 jetted or circulated a drop ball 76 is inserted into the
3 central bore 50 to travel through the body and locate in
4 a ball seat 78 of the second sleeve 66. Ball 76 blocks
5 the axial passage of fluid through the bore 50 and as a
6 result pressure will build up on an upper surface 80 of
7 the ball 76. The increase in pressure will shear the pin
8 74 and allow the sleeves 66, 64 to move axially through
9 the bore 50. The sleeves 64, 66 will move together by
10 virtue of the shear pin 72. The sleeves 64, 66 travel to
11 a stop 82. At the stop 82 the sleeve 64 and 66 are
12 positioned such that the ports 68 and 70 align with the
13 port 58 and thereby allow fluid in the bore 50 to enter a
14 channel 54 and exit the jetting ports 44.

15

16 Once the jetting and circulation requirement is complete
17 the tool 10 can be closed as shown in Figure 2(c) by
18 virtue of a second drop ball 84 being inserted through
19 the bore 50. Ball 84 is a larger diameter than ball 76
20 and locates on a ball seat 86 on the second sleeve 66.
21 Ball 84 prevents the passage of fluid through the bore 50
22 and thereby pressure increases on its upper surface 88
23 until the shear pin 72 shears and the sleeves 64 and 66
24 disengage from each other. On disengagement the
25 innermost sleeve 66 will fall relative to the outer
26 sleeve 64. The innermost sleeve falls a distance to a
27 second stop. In this position a by-pass channel 90 in
28 the first sleeve 64 provides a passage of fluid around
29 the drop ball 84. Similarly, at drop ball 76 a by-pass
30 passage towards the body 20 is now accessed from ports 92
31 in the sleeve 66.

32

1 Thus, in the closed position the port 70 of the inner
2 sleeve 66 is now misaligned with the port 66 of the outer
3 sleeve and the port 58 leading to the channel 54. By
4 the insertion of two drop balls, the tool has performed
5 one cyclic function in taking the jets 44 from a closed
6 position to an open position and again to a closed
7 position.

8
9 Referring back to Figure 1, it will be seen that a
10 similar actuating means as shown in Figure 2 can be
11 located at position 60 and through port 56. A second
12 cyclic motion can be performed. In this regard, a twin
13 cycle is possible with tool 10 and thus by timed
14 insertions of drop balls of sufficient diameter the
15 jetting ports 44 can function in a selective on or off
16 position.

17 ***

18 As will be appreciated by those skilled in the art the
19 actuator means 60,62 in Figure 1 may be replaced by any
20 actuator means which causes selective opening and closing
21 of a channel 56, 58 into the channel 54 to give access to
22 the ports 44. Reference is now made to Figure 3 of the
23 drawings which illustrates a portion of a circulation
24 tool generally indicated by Reference Numeral 100 which
25 could be used as the actuating means 60, 62 of a downhole
26 tool of the present invention. Like parts to those of
27 Figure 1 have been given the same Reference Numeral. As
28 with Figure 1, the actuator means 100 is positioned on
29 the body 20 with the through bore 50. The actuator means
30 comprises a sleeve 102 located on the body 20 which is
31 biased against the body by means of a helical spring 104.
32 Located in the sleeve 102 are two vent holes 104, 106,
33 which permit the equalisation of pressure outside the

sleeve 102 with pressures between the sleeve 102 and the body 20. Also, located in the sleeve 102 is a plurality of ports 114. Also mounted on the body 20 to engage the sleeve 102 are five O-ring seals 112, which sealingly engage with the sleeve 102. On the inside of the sleeve 102 adjacent to circulating ports 110 is an internal groove 114 found on the inner surface of the sleeve 102.

Although the sleeve 102 is a spring tensioner ring 116 which is threadably engaged to the body 20 through a thread formation 117, a set screw 124 is provided to lock the spring tensioner 116 in position on the body 20.

The spring tensioner 116 has a single shoulder 118 to which hard facing in the form of tungsten carbide 119 is applied. At the lower end of the sleeve 102 adjacent to spring tensioner ring 116, an actuating shoulder 120 is provided.

The actuating element 100 is moved by virtue of the shoulder 120 contacting a formation on the well bore. This formation may be the upper edge of a liner or polished bore receptacle. Initially when the shoulder 120 contacts the formation, the tool remains in the position shown in the Figure. In this position the tools 110 are obturated by the sleeve 112 and fluid can be pumped through the bore 50. Weight can then be set down upon the tool 10, this weight causing the body 20 to drop relative to the sleeve 102 when the helical spring 104 will be compressed. Travel up the sleeve 102 is limited by a shoulder 125 contacting a surface 127 formed as a lock on the body 20. This helps prevent the spring 104 becoming spring bound. When the shoulder 125 abuts

1 against the lock 127 the groove 114 is adjacent to the
2 holes 110 and the holes 110 communicate with a port 130.
3 It will be appreciated that port 130 is equivalent to the
4 ports 56, 58 of Figure 1 and thus fluid from the bore 50
5 again can pass into channel 54. To close the port 130
6 weight is lifted off the tool and the spring 104 washes
7 the sleeve 102 to return to the position shown in Figure
8 3.

9
10 A principal advantage of the present invention is that it
11 combines a number of functions on a single tool within a
12 well bore. A further advantage of the present invention
13 is that it can provide an increased annular velocity for
14 hole cleaning due to the small clearance provided between
15 the ports 44 and the inner surface of the well bore or
16 tubular in use.

17
18 It will be appreciated by those skilled in the art that
19 this tool can replace a conventional stabiliser used in a
20 bottom hole assembly. Further, drilling can be performed
21 with this tool mounted in the bottom hole assembly and
22 the tool can be also used to pump mud while drilling.
23 Alternatively, the tool can be used to jet clean the low
24 pressure housing, the high pressure well head and
25 downhole casing adapter profile, as it is more effective
26 than using the bit and does not require an extra trip
27 into the well. The tool can further be run in
28 conjunction with a mud motor and can be used to shut down
29 the bit at the shoe to minimise where casing were while
30 pumping. It will also be appreciated that the tool may
31 be run in conjunction with an under reamer and can be
32 used to deactivate blades at a shoe. This can be used in
33 preference to dropping a dart.

1 Thus, the present invention provides a large outer
2 diameter jetting and circulating device that acts as a
3 drilling stabiliser as well and can be activated by
4 different means one or more times. Thus, specific areas
5 within the well can be jetted at various times without
6 retrieval of the string from the well.

7

8 Various modifications may be made to the invention herein
9 described without departing from the scope thereof.

10 Primarily it will be appreciated that any actuating means
11 which provides selective opening and closing of a channel
12 in the body of the tool may be incorporated as one or
13 more of the actuating means in the tool of the present
14 invention.

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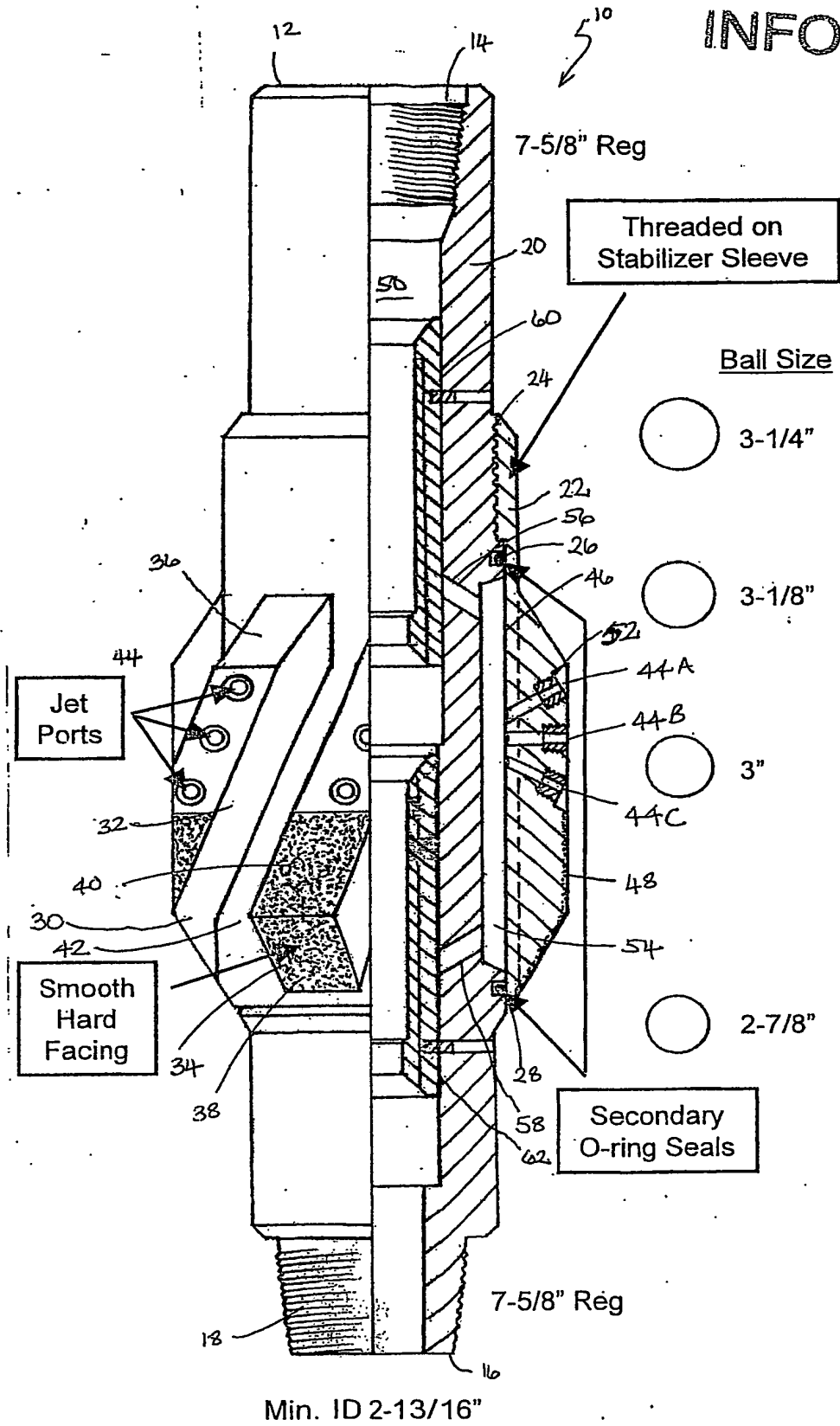
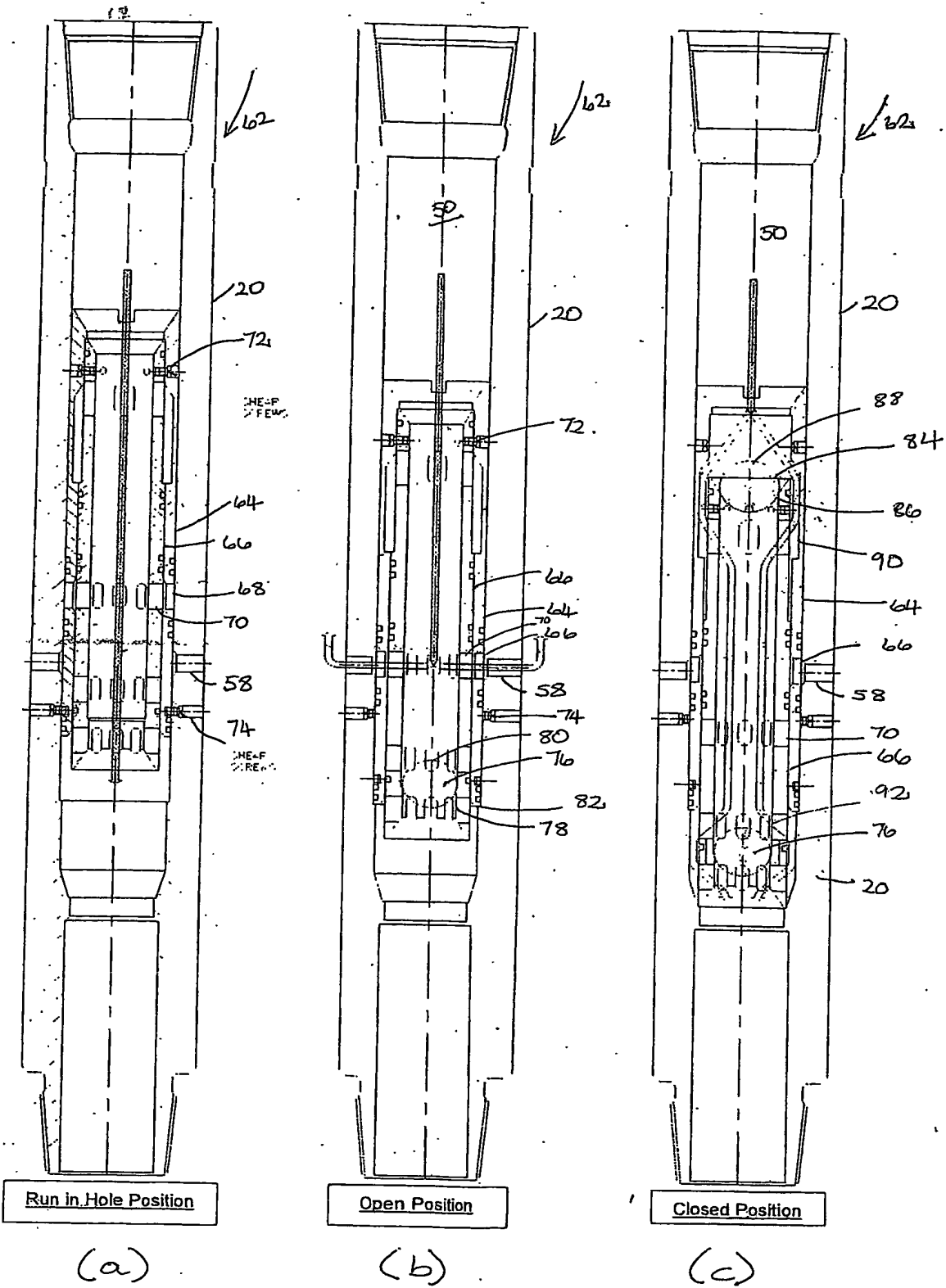


FIGURE 1

FIGURE 2

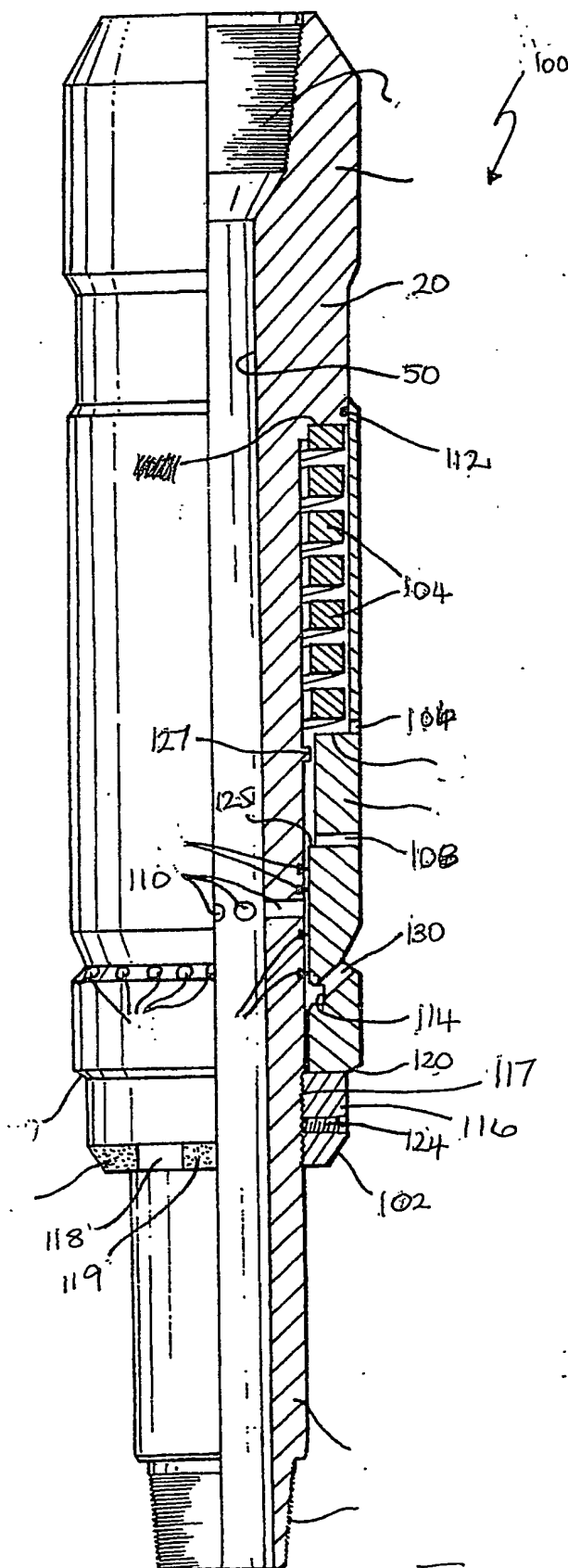


FIGURE 3